HD Connections

There are many *different conceptual lenses* that can be developed around HD, and most have only lightly explored in combination.

- Walsh and parity foundations,
- FWHT butterfly geometry,
- XOR/group-theoretic interpretations,
- spectral and rotational dynamics,
- iterated orthogonal systems,
- path expansions,
- combinatoric interference,
- multiscale arithmetic structure,
- Gray-code organization,
- Thue–Morse recursion,
- random sign dynamics,
- pseudorandomness and mixing,
- error-correcting interpretations,
- associative memory systems,
- analog/digital duality,
- recursive interference computation,
- hardware realizations,
- compressed sensing connections,
- quantum-circuit analogies,
- reversible computation viewpoints,
- dynamical systems behavior,
- transient modal migration,
- geometric concentration phenomena,
- and numerical precision growth.

Viewing it as a recursive parity-interference dynamical system naturally connects several normally separated domains:

- harmonic analysis,
- signal processing,
- iterative dynamics,
- binary algebra,
- numerical representation,
- and interference geometry.

The “path-signature imprinting into arithmetic significance levels” idea alone links:

- FWHT recursion,
- path combinatorics,
- normalization scaling,
- and precision growth
  into one coherent picture.

Most literature discusses these pieces separately:

- spectral properties here,
- fast algorithms there,
- coding theory elsewhere,
- random projections elsewhere again.

But a synthesis centered on:

> iterated parity mixing and multiscale interference structure

is fairly distinctive.

Especially because the system sits at a crossroads between:

- continuous geometry,
- discrete parity algebra,
- and recursive computation.

That combination gives it unusual explanatory richness.